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Infantry Fire Tactics
FOR THE
Canadian Militia

BY

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Infantry Fire Tactics suitable to the Canadian Militia.

A LECTURE DELIVERED ON 26TH APRIL, 1890, AT THE CANADIAN MILITARY INSTITUTE, TORONTO, BY MAJOR C. B. MAYNE, R.E., PROFESSOR OF SURVEYING, ETC., ROYAL MILITARY COLLEGE, CANADA.

Modern meaning of the word "Tactics."

The subject before us this evening is one which is second to none in importance in the whole range of military art. But before proceeding further, it may be remarked that of late years the word "tactics" has developed a wider meaning than the one usually attached to it, namely, the mere handling of troops under fire, so as to ensure and, if possible, to secure victory. The newer and more useful meaning now attached to the word "tactics" is best expressed by the word "*execution*," in the sense of "*the methods adopted for carrying out*" anything. In this sense we now find in most military writings of note the word "tactics" usually qualified by some other word, for instance, Battle Tactics, Fire Tactics, Marching Tactics, etc., meaning the execution of, or methods adopted for carrying out a battle, fire, marches, etc., respectively, and it is in this wider sense that the word "tactics" is used in the title employed to express the subject matter of this lecture.

Outline Description of a Modern Battle.

The importance of the subject of Infantry Fire Tactics will perhaps be best understood if we first consider for a moment what a modern battle is.* In this term "battle" I do not mean a guerilla skirmish, or the fighting that takes place in irregular warfare, but the combat undertaken between two highly organised and trained forces, armed with modern weapons and skilled in their use. Further, we must suppose that the fight takes place in daylight and in ordinary country, over which the advance to the attack can be seen, to a certain extent, by the defenders.

Under such conditions the battle is not a quickly decided act. On the contrary it cannot be too strongly remembered that the battle is a long drawn out and continuous act, in which 4 periods can usually be distinguished, though they cannot always be clearly separated. These periods are :

1. The Period of Reconnaissance.
2. The Period of Preparation or Destruction.
3. The Period of Decision.
4. The Period of Completion or Retreat.

The Period of Reconnaissance is daily growing more and more important as weapons improve. During this period the mounted troops will drive in the enemy's advanced troops, draw his fire, and ascertain where his flanks end. The drawing of the enemy's fire is necessary to ascertain the disposition of his infantry and

*The following remarks refer to army corps units and under.

artillery in his front line. During this period, which it may be judicious to prolong until all the reports of the enemy's position and disposition have come in, the positions for the artillery of the attack are chosen and the ranges measured.

When these positions have been chosen and the artillery has arrived and is drawn up ready to enter into the fight, then the Period of Preparation or Destruction commences. This preparation is begun by the artillery coming into action, protected by a small portion of the infantry, and until this preparatory artillery fire has produced a considerable effect, which it may take some hours to do in some cases, it would be making a useless sacrifice to attempt to push forward the bulk of the infantry. But as the artillery succeeds in its object of destruction or preparing the way, the infantry and machine-guns are pushed forward until they can, with their fire, begin to effectively assist in the destruction of the enemy; this pushing forward of the infantry and machine-guns will usually take place *after* the enemy's artillery has been somewhat subdued and our own guns have been turned on the enemy's infantry. It may be assumed that during this period of destruction the attacking line will arrive at a distance probably about 600 yards or less, from the defender's position. It is especially during this period that the G. O. C. must decide on the point of assault and where direct the bulk of his reserves.

The Period of Preparation having been completed as judged by any disorder appearing in the enemy's ranks, or by the lessening efficacy of his fire, the order is given for the decision, which is then carried out with the greatest energy and celerity. The fire is maintained, but with as few and as short stoppages as possible. Bayonets are fixed, a rapid fire is delivered at about 100 yards from the enemy for a few minutes, when the advance is sounded and the charge takes place over the last 50 yards with cheers, bugles sounding, drums beating, colours flying, and all the pomp and dash of war.

Then follows the final period of completing the victory or of retreat, into which we need not enter more than to say that if the pursuit cannot be taken up by fresh troops, the retreating enemy should be subjected to volley firing and not be followed up recklessly by disorganised troops, who would be easily checked, and perhaps even routed, by any organised and intact reserves the enemy may still possess.

Thus we see that a battle is a long continued act, and is chiefly composed of a long drawn out destructive act or fire combat, and a short, sharp, decisive act or close combat. Both kinds of combat are essential though their relative values alter with the size and quality of the combatant forces. But time does not permit of our entering into this important question, nor as to how it affects the fronts to be taken up by different sized units for both the fire and for the close combats. But what I desire to impress on you is that the fire combat or the destructive act is, or rather may be, of considerable duration, and that during its continuance it is necessary to make the very best use we can of our fire, whether it be artillery, machine-gun, or infantry fire. The ad-

vance of the firing line during this period may be frequently checked and the firing line even sway backwards and forwards according as it feels the pressure of the enemy's fire, or is carried forward by the impulses given to it by any fresh troops sent into it from the rear. During this fire combat both sides are trying to wear down the resisting and destructive power of the opponent. Both sides get gradually disorganised and demoralised, but victory remains with the side which, at the decision, is least disorganised and demoralised. And this disorganisation and demoralisation is effected by fire alone. Hence we must consider how best to employ this fire, in order to get the best results with the least expenditure of ammunition, which at such moments is of priceless value on account of the present impossibility of replenishing in adequate quantities.

This consideration we include under the name of *fire tactics*, and though this subject is capable of many subdivisions, yet it is not proposed to define them very closely, because in dealing with the affairs affecting human nature there is as much danger in too close and fine definitions as in no definitions at all.

"The Man."

Again it is very essential in all military matters to consider *the man*, "*the essential man*" as Emerson calls him. We must always remember that the value of all weapons depends on the man using them, and the value of all methods of procedure depends on the training and discipline and characteristics of the men and officers who employ them. And herein lies my difficulty as lecturer. I am addressing a body of officers, who command troops whose training and discipline is not and cannot be expected to come up to those of European troops, who are continuously under arms and training for a considerable term of years. We can expect and do expect more from such troops than we have a right to expect from troops like the Canadian Militia, with their limited means of training. We must always remember that men are controlled more by emotions and habits than by a mere knowledge of what they ought to do, *i.e.*, by the truth. Training and discipline are powerful means of overcoming the inherent fear of death and pain and the dislike of the fatigues and discomforts so inseparable from war and consequently of making men better fighting organisms, and more amenable to control during the demoralising influences of battle and of war generally. But the problem that faces every officer is, *How to best make use of the various elements which lie at his hand on the day of battle?* The theoretical must then give way to the practical. And in thus making good use of the available material lies the test of a good officer. The fault of our text books is that they only consider the theoretical material and rarely the actual material that has to be made use of. The French in 1870-71 had a far better rifle than the Germans, and the Turks in 1877-78 had better rifles and artillery than the Russians, yet both the French and the Turks were defeated, chiefly because their opponents made a better use of what they actually possessed than did the French and Turks. Mere superiority of armament is not

everything, which fact may afford some consolation to Canadian troops armed with the Snider.

With these premises we can now enter into the subject before us this evening, namely : How to make the best use in battle of the fire of the Snider Rifle with which the Canadian Militia is armed ?

Estimation of Ranges and Backsight Elevations.

But as it is necessary, in all cases, to know the range in order to obtain an effective fire, I will briefly enumerate the different ways in which the range can be ascertained with more or less accuracy:

1. By direct measurement.
2. By range-finding instruments.
3. By surveying instruments.
4. By comparing known heights, the distance of one of them from the observer being known.
5. By measurements from maps.
6. By estimating by sound.
7. By the practice of artillery near at hand.
8. By watching the "strike" of the bullets.
9. By estimating by eye.

Of these methods the first can only be used by the defence before the arrival of the enemy; range finders are as yet only suited for artillery purposes; surveying instruments can only be used in stationary warfare, such as sieges; the results obtained by comparing known heights are not very reliable; and maps of a suitable scale for measuring ranges on are rarely available. The most practicable methods on the battle field are the 6th, 7th, 8th, and 9th. But to estimate by sound, we have to wait for the enemy to open fire, and it is only suited to the commencement of a fight before much firing takes place; from the ranges found by the artillery, we must allow for the distance of the infantry in front of or in rear of the artillery and also for the distance between the target being fired at by the artillery and the target that the infantry have to fire at. But this means of finding the range is only suited to the moment when the infantry are passing the artillery during their advance. "Picking up the range" by watching the strike of the bullets should always be done, but this requires suitable ground for the bullets to fall on and great care is required in making such observations for reasons to be stated presently. In reality the only really available means by which ranges can be estimated at all times is by the eye. This, however, requires much practice over varied ground and under different conditions to obtain even moderately good results. For instance, the average errors of *trained* men are as follows:

At 300 yards $\frac{1}{10}$ th }
At 600 yards $\frac{1}{8}$ th } the estimated range.
At 1,200 yards $\frac{1}{6}$ th }

This being the case we must accept it as one of the factors we have to deal with and make the necessary allowances for it. How this can be done will be explained presently. But a very good

custom may here be mentioned. In the German service, the best 6 men at range finding by eye, in each company, have the duty of guessing the range and calling out their estimate of it to the Company Commander entirely thrown on them. The Company Commander then uses the mean of the estimates as a basis for his orders.

When the range is once known then allowances must be made for any movements on our or the enemy's part. But the range being known, the duty of those looking after the men does not end with ordering the men to adjust the slide on the backsight to the engraved graduation for that range and to seeing that they do it.

The rifle is sighted for a temperature of about 60° F., a barometric pressure of 30 inches, a still atmosphere, and a horizontal line of sight. If the temperature and barometric pressure differ from these data, then the range for a given backsight graduation alters;* and further a head or rear wind will make a bullet go further or fall short respectively, while a side wind will drive the bullet to one side. The heating of the rifle barrels and the condition of the fouling in the barrels will also have their effect on the proper elevation to be used. So that whatever elevation is ordered to be used, it must only be looked on as an approximation to the truth, and the fire must be carefully watched to see if any corrections are required to be made to the backsight elevation ordered to be used. Further, if the line of sight is inclined upwards or downwards the elevations used must be less than when the line of sight is horizontal. For instance with the Martini Henry rifle, if the line of sight is inclined upwards 40°, we must use the 500 yards elevation to hit an object 600 yards away; and if the line of sight is inclined 40° downhill we must use a still lower elevation. These statistics are only given to illustrate the necessity for officers to watch the effect of the fire of their men carefully in order to correct, if necessary, the backsight elevations being used.

The Evil of Uncontrolled Fire.

We have always to consider infantry fire under two aspects, viz.:

- (a) Uncontrolled or independent fire.
- (b) Controlled fire.

Uncontrolled firing takes place when each man chooses his own target, his own elevation, his own rapidity of fire, and his own times for opening and ceasing fire. *Controlled firing* is the exact converse of this.

It is almost needless to say that uncontrolled fire should be absolutely prohibited, as it invariably leads to confusion, disorder, and demoralisation, while causing a waste of invaluable ammunition at a period when it is impossible to replenish it in sufficient quantities to make up for the consumption. Further, an uncontrolled fire in which each man chooses his own objective and backsight elevation, when in a state of great moral excitement and

* As far as the atmosphere alone is concerned the bullet goes further 1-1000th part of the range engraved on the back sight for each 1° F. rise of the thermometer above 60° F. and 15-1000ths parts of the range engraved on the backsight for each 1 inch fall of the barometer below 30 inches; and *vice versa*.

mental strain, is very ineffectual. An uncontrolled fire when once started under such conditions will probably not cease until the last round has been expended, and will very probably have been directed for the most part wildly into the air. The great fault of all shooting in the field, especially at the closer ranges, is that it is too high.

Individual Firing.

Thus confining our attention to controlled firing alone, we have to deal with it under two conditions :

- (a) Individual firing.
- (b) Collective firing.

Of these two the latter should be the general case in battle ; the former should only be used in the final stages of battle and in some special cases, as on outpost work, etc. But as individual firing at all ranges is held in such esteem throughout the whole Imperial, including in this term the Colonial, forces, it is necessary to thoroughly understand its capabilities.

The first thing I desire to impress on you, gentlemen, is the utterly false impression one is apt to get of individual firing from ordinary target practice, when firing a few rounds only over measured and known ranges, with the result of each shot being signalled back. Under such conditions the nearer we get to the target the better is the shooting. But in the field, ranges are not known exactly, the enemy does not signal back whether you have missed him or hit him above or below the point on him that you aimed at ; the men are probably tired for want of sleep, parched with thirst, hungry for want of food, and fatigued after a long march under a hot sun, over bad roads, or by an advance by rushes under fire ; if the advance has been rapid the men lose their breath, their chests heave, their arms get tired and the rifle cannot be held steadily, especially if a wind is blowing, and when the men are unnerved and excited by the danger arising from the fire of the enemy, which important cause of disturbance is always absent in peace practice. The nearer the enemy is approached the greater is the effect of this adverse condition of things, added to which is the painful effect of the recoil after 40 or 50 rounds have been fired, and the effect of the disorder, demoralisation, and excitement which occurs in all fighting and danger. The mass of the men will, under such circumstances, forget to adjust their sights to the range ; they will use a full foresight if they use any at all ; they will probably aim at the enemy's chest, and many will even discharge their rifles from the hip. Consequently the fire is usually much too high and decreases in efficacy as the range gets shorter, which is just the opposite to what we find on the ordinary ranges. It is very important to remember this, for it has frequently been observed that when men find that they apparently cannot hit an exposed enemy at what seems to be an easy range, they get discouraged after 2 or 3 rounds and then fire wildly. One well-known French writer asserts that in the field an average shot, will fire at an isolated standing enemy, who is supposed to remain stationary, the following number of rounds to put him out of action : 5 to 6 rounds at

330 yards; 10 to 12 at 440 yards; 14 to 16 at 550 yards; and 30 to 34 at 660 yards. Another French writer estimates that three times the above amounts of ammunition are required at the same ranges!

Hence it is very important not only to remember but also to warn the men not to expect very much from their individual fire in the field, and that they should not be discouraged even by a series of misses. Even at target practice a good shot may miss a standing man at ranges over 400 yards and yet be shooting well.

Here I must remind you again, gentlemen, that we must accept human nature as we find it and make the best use of what we have. The problem, therefore, is: Accepting the fact that individual fire in the field is, as a rule, especially at long ranges, inaccurate, how can we reduce this inaccuracy and make the best use of the fire of the troops?

Major Mieg, of the Bavarian army, offered a solution to this problem in about 1876, and his solution made public in 1878 was adopted first by the German army, and then by every European army, but our own, *in toto*. We are gradually adopting these ideas, which I will now explain.

In the first place, to reduce the inaccuracy of individual fire as much as possible, it must be confined to such ranges at which the bullet does not rise more than the height of a man above the line of sight. The limiting range for the Snider rifle is, under such conditions, 350 yards. Then by using the 300 yards backsight to make up for the effect of the full foresight which the men *will* always use in the field, and by always aiming at the enemy's feet, he will be hit somewhere so long as he is anywhere inside of 350 yards distant. In this way the range need not be guessed nor the backsights touched when the enemy is once within 350 yards. Some writers advocate the use of the 200 and even the 100 yards elevation throughout these short ranges, with low aiming, to counteract the well-known tendency to fire high, especially when men are excited.

Such a fire is a *grazing fire*, and is called a *fire of certainty*, relatively of course, to distinguish it from the collective fire at longer ranges, of which we are to speak of presently, and which is a *dropping fire* or a *fire of probability*. In a grazing fire we do not require to know the range; but it is essential to approximately know the range for a dropping fire if we desire even fair results.

Subdivision of Ranges.

Before passing on to consider the characteristics of a collective fire of probability, we must refer to the *subdivision of ranges* which is now usually accepted. These subdivisions are as follows:

	SNIDER. yds.	M. HENRY. yds.
1. <i>Short</i> —up to extent of grazing fire - - -	350	400
2. <i>Medium</i> —from the short up to double the extreme short range - - - - -	700	800
3. <i>Long</i> —from the medium up to highest graduation of enemy's rifles, about - - - - -	1700	1700
4. <i>Extreme</i> —all ranges over the extreme long ranges.		

In the *short* ranges, controlled individual firing is allowable, because the time has passed for concentrating the fire on particular points; these points have already been prepared for being assaulted by having been subjected to a heavy fire, and the assaulting troops have been directed on them, and each man has now to advance to his direct front and fire at the enemy immediately in his front.

Collective Firing.

But at ranges over the short ranges the men's fire must be directed on such points where the enemy's resistance is greatest, and for this purpose a *concentrated collective fire* must be employed. Suppose that the statement is correct that in the field a man has to fire 30 shots at 660 yards to hit an upright enemy. In making this statement we have to further suppose that the enemy will stand still to be fired at, which, however, he will not do; so that the soldier, if he misses in his first shot, will not have the opportunity of firing his 30 rounds. To overcome this difficulty we can make 30 men fire at the enemy and then one or more is sure to hit. Another advantage is gained in so doing, namely: That when one man fires 30 rounds, half his ammunition supply is gone and he has taken some time to do this, whereas if 30 men fire, they have only expended one round each, and have obtained the desired result at once. This is the principle involved in concentrating collective firing on certain stated objectives. It is very important to remember this principle, especially in irregular warfare, when, as so often happens, the enemy are individually better shots than our own men. The peculiar characteristic of this kind of fire is that it covers a belt of ground at least 100 yards in depth on horizontal ground with dropping bullets. The mass of the bullets fired (70 per cent.) fall within this *beaten zone*, as it is called, of 100 yards in depth on a horizontal surface. This holds for all ranges beyond the short ranges. The cause of this spread of bullets is due to the fact that different men will not adjust their backsights to the same point, will not use the same amount of foresight, and will not keep their sights upright; some will jerk the trigger, others will not have their rifles steady at the instant of discharge, etc. It is on account of this longitudinal spread of the bullets that a collective fire at the longer ranges is called *a fire of probability*; the object is to so cover the ground on which the enemy is with bullets, as to make it probable that some of the bullets will take effect. The efficacy of such a collective fire, supposing it well placed, depends on the drop of the bullet measured with reference to the line of sight. The less the drop the better the effect of the fire, and as the drop decreases as the range decreases, a collective fire also rapidly increases in efficacy as the range decreases.

The *dangerous zone* of a collective fire is the beaten zone (about 100 yards on horizontal ground) *plus* the grazed zone of the bullets falling at the end of the beaten zone nearest the firer. This grazed zone is the distance over which the bullet remains under the height of the target above the ground on which the target stands.

If the beaten ground slopes upwards with reference to the line

of sight, the extent of beaten and dangerous zones are diminished; but if the beaten ground slopes downwards with regard to the line of sight, the beaten and dangerous zones are often greatly increased. For this latter reason the reserve troops of the defence should be kept well in rear of the firing line at the early stages of the fight, and close up to them at the latter stages, which is a favorable condition for the defence.

Further, it must never be forgotten that in collective firing, as in all kinds of firing, a careful watch must be made as to the effects of the fire so as either to stop it if no effects are being produced, which only depresses the men and elates the enemy, or to correct the elevations used if necessary, for atmospheric conditions, the inclination of the line of sight, and the slope of the beaten ground, and for the unavoidable errors made in judging the range, all of which affect the fire and the proper elevation to be used.

On account of the longitudinal spread of the bullets in a collective fire, we must be very careful not to be misled in watching the strike of the bullets. We must remember that even though many of the bullets fall short yet the fire may be well directed. If either side is stationary, or if the ranges are rapidly decreasing from either side advancing, it is better for a fire to fall rather short of than rather over the target, for in the former case we get the benefit of ricochetting bullets, which are lost when the mass of the bullets pass over the target. If the ranges are rapidly increasing, oversight for the supposed ranges.

Use of Combined Sights.

Sometimes it is necessary to cover a greater zone than 100 yards with bullets. This is done by making half the men fire with an elevation for 50 yards under the supposed range, and the other half with an elevation for 50 yards over the supposed range. In this way a zone of 200 yards is covered with bullets. But at least a whole company should be used in this way so as to get a result as rapidly as possible, because prolonged firing ought always to be avoided when possible from the bad effect it has on the men in reducing their offensive spirit. A bold use of men and ammunition is always a good policy when once the fire is effective. *But as such a use of combined elevations means a proportionately great consumption of valuable ammunition, it should only be used when there is ample ammunition, when the enemy offers a good target, when the range is not accurately known, when one side is in movement, and when the atmospheric influences and the slopes of the ground near the enemy are not favorable, and the strike of the bullets cannot be observed.* Further, such a use of combined sights is only possible at the long and at the longer of the medium ranges while men are sufficiently under control for the purpose.

But in all cases it cannot be too strongly impressed on both officers and men that as the range increases (even when only one elevation is being used), the amount of ammunition expended has also to be greatly increased in order to get the same results in the same time, and if more than one elevation is used a proportionate amount of ammunition must be used.

The Question of Long Range Firing.

But much has been said for and against long range firing. No doubt long range firing has never produced any decisive results in war, though it may have produced excellent results in special cases. Victory is decided at the *short* ranges, but it is prepared for in the *medium* ranges. Hence these are the important ones. Long range firing to be effective requires a large consumption of ammunition and a prolonged concentration of fire. But this prolonged firing takes away from the offensive spirit of the men. But *where there is ample ammunition, which can be easily replenished, and if the ranges are known or the effects of the fire can be observed, if the atmospheric condition and the slopes of the ground of reception are not too unfavorable, if the object fired at is of suitable dimensions especially as regards depth, and if the fire is executed by troops specially detailed for the purpose*, there is no reason why the long ranging power of modern rifles may not be judiciously and cautiously indulged in as a treat. But it should be stopped if, after some minutes, no results are observed from its use, and it should never be permitted without the consent of the senior officer within reach.

The Direction, Control and Discipline of Fire.

We now come perhaps to the most important part of our subject,—the *direction* of, the *control* of, and the *discipline* required for modern infantry fire. *The duty of directing the fire* falls on the company leaders and officers senior to them; *the duty of controlling the fire* falls on the junior officers and the N. C. Os.; the *discipline* required to enable this direction and control to be carried out rests with the men.

A good fire discipline is obtained when the soldiers will not fire until ordered, nor when in motion, when they will only fire at the object named and with the elevation ordered, and when they will cease firing when ordered. Simple as these requirements are, yet they can only be attained by a careful peace training.

The control of the firing consists in imparting to the men the orders given by the company and higher commanders, and in seeing that these orders are obeyed and even in enforcing their execution.

The direction of the fire consists in determining, at each moment of the fight, (1) the opening and the ceasing of the fire; (2) the amount of ammunition to be expended at each moment to attain the object in view, taking into account the available supply of ammunition and the facilities for replenishing it; (3) the number of men required in the firing line to expend this ammunition in the desired time; (4) the selection of the objects to be fired on, and their allotment to different portions of the firing line; (5) the range and elevation and number of elevations to be used; (6) the observation of the results of the fire; (7) the kind of fire to be used; (8) the rapidity of the fire; (9) the moments of advancing and halting; (10) the attitudes of the men during each halt; (11) the moment for fixing bayonets; and (12) the replenishing of the expended ammunition, etc.

Some of these points have already been touched on, and so I shall confine my remarks briefly to such points as have not already been referred to.

(1). With regard to *the distances at which infantry fire may be opened in battle* under normal conditions, the following may be said :

In the attack, a premature opening of fire only lengthens out the fight, diminishes the offensive spirit, and may cause an exhaustion of the ammunition when the closer and more important ranges are reached at which the battle is decided. The French defending the village of St. Privat, which formed the French right at the battle of Gravelotte (18th Aug., 1870), had to retire before the German assault for want of ammunition, although they had practically annihilated by infantry fire a previous assault on the same village. Hence the attack should try and get as close to the enemy as possible before opening fire, that is as close as possible without suffering *undue* losses. But even in open country, fire should not be opened in a general manner by the attack until the medium ranges are reached, at all events for troops armed with the Snider rifle and carrying the very limited supplies of ammunition which heavy ammunition entails.

In the defence, however, fire may be advantageously opened at the *long* ranges, especially if the conditions for effective long range fire are present. The defenders would, or should, always know the ranges of various prominent objects in front of them and they have, as a rule, good opportunities for observing the effect of the fire.

But in temporising actions or in false attacks, fire may be opened at long ranges; also if there is no artillery or if the artillery arm is weak, infantry may open at longer ranges than usual to prepare the way for its own attack: but in this case a large supply of ammunition should be provided and special troops detailed for the long range firing.

But it must never be forgotten that as a rule too much is expected of infantry fire. Always remember that *at all ranges over the short ranges, efficacy of fire can only be obtained by a relatively long-continued collective fire concentrated on objectives specially selected on account of their offensive or defensive importance at the moment.*

(2, 3). As regards the amount of ammunition to be expended and the number of men to be employed in the firing line to expend it in a reasonable time, we must remember that the moral effect of losses inflicted on an enemy is greater, as these losses are more quickly inflicted. This is one reason for employing as many men as possible. On the other hand we must not have so many men exposed as to cause undue exposure to and losses from the enemy's fire, *until* the effective ranges are reached. When such ranges are reached, we must seek to avoid losses not by mere formations, but by the destruction and demoralisation of the enemy. At this period of the fight, boldness and not caution is real prudence. When long range fire is indulged in, as many men as possible should take part in it to arrive as rapidly as possible at the desired result.

(4). As regards the choice of objectives, it is very necessary to

remember that in the long and medium ranges the fire of large portions of the firing line should be directed on certain stated targets, and that each man should not be allowed to fire at a separate target.

The difficulty lies in the selection of the objects to be fired at and in apportioning the different objects selected to different parts of the firing line. The means of effecting this latter point we shall deal with presently. But the general rule for the choice of objectives at any given moment is to choose such parts of the leading portions of such fractions of the enemy's troops as are the most dangerous for the time being, *i.e.*, which for the time being constitute the chief danger to be guarded against. The most advanced portions of the enemy are as a rule the most dangerous, as they draw the other portions after them. Hence they should be crushed. A frequent change of the objectives scatters the fire, so when you have chosen an objective, fire on it until you have destroyed it, or at least paralysed its action, for some time. Choose for preference objectives in front of your own men before selecting others to the right or left in order to assist the advance of neighboring troops. If the enemy's leading line is checked or offers a bad target, then choose suitable objectives to the right or left or in rear of his leading line. In cases of doubt choose as targets those objects which can be most easily hit. But as a rule the usual mark to aim at is the smoke of the enemy's rifles and artillery. In choosing objectives we must let the question of range (involving effect of fire and errors of estimation of range), atmospheric conditions, slopes of ground, etc., have their full weight. The officer commanding the firing line apportions the targets to the different parts of the firing line during the pauses in the fire (see page 14).

(5). As regards the range and elevations and number of elevations to be used, much has already been said, but it cannot be too strongly remembered that the efficacy of all fire depends more on the range being known than on the individual skill of the men in firing. The worst shot may hit if the range is known, but the best shot will not hit if the range is wrongly estimated. Hence the value of carefully watching the effects of the fire, and of making any suitable corrections to the elevations employed.

The effects of the inclination of the line of sight and of atmospheric conditions must not be forgotten in ordering the elevation to be used.

In cases of doubt use too low than too high elevations. If either side is advancing, always undershoot for the supposed range, and only alter your elevations by at least 100 yards at a time.

Against charging cavalry, only use the 400 yards elevation and aim at the hoofs of the horses.

(6). As regards the observation of the fire, we must remember that in a well-directed fire half the bullets will fall short, and consequently the dust produced by bullets 50 to 70 yards in advance of the object is not a proof that the fire is too short, though no dust in a favorable soil for observation is a certain indication that the fire is too long. If you are to one side of the men firing, say on the right of them, then a too short fire will appear to fall to

the left of the mark, and a too long fire to the right of it, even if its direction is good. This fact must be carefully remembered.

With regard to estimating the ranges, the German practice of "range finding squads" is worthy of imitation.

(7). The question of the kind of fire to be used is of very great importance, for it is greatly affected by considerations of human nature and of the means of handling troops under fire. There are two kinds of controlled fire:

1. Individual fire.
2. Collective fire. {
 - a. Volley firing.
 - b. Mass firing.

Uncontrolled fire will come of its own accord when the moral and mental strain of battle becomes too great for control. Hence it need never be ordered. Every effort, indeed, should be made to avoid such firing. We have only to deal with controlled firing, and we can control collective firing either by employing volleys, or by employing mass firing (which is really only a more perfectly controlled individual firing than the individual firing we have already considered) of a limited number of rounds (4 at the most), when the fire must cease until ordered to be renewed after a slight pause.

In individual firing the trigger is pressed directly the alignment is obtained; in volley firing the alignment, when obtained, has to be maintained until the order to fire is given. As this is not easy to do, and as some men are, more or less, disturbed by hearing the sudden command to fire, the result is that in peace experiments deliberate individual firing has always given better results than volley firing. The advocates of volley firing say, that though this is the case on the practice range, yet the reverse will be the case on the battle field, for the men will be kept in hand better when volleys are fired. Here is a delicate question of human nature. My own impression is that it requires highly disciplined troops to use volleys under an effective fire, for during the frequent pauses they will hear the enemy's bullets and the sound of his fire, whereas individual firing, by making a continuous noise, prevents this. Further, volley firing at even medium range requires more control than can be expected from any but highly trained troops.

Volleyes should only be fired by companies in close order, or half companies in rank entire, or sections in open order. Other units are too large for the purpose.

Other advantages are claimed for volleys, such as economy of ammunition, facility for changing objectives and elevations, especially when the target is charging cavalry, etc. But these advantages can be equally claimed for mass firing conducted on the lines to be presently indicated.

Now volley firing, however good in theory, requires for its execution the maintenance of the organic units. Hence volleys are only practicable so long as these units are maintained intact, which will only occur when close order formations are used (as in savage warfare), or so long as the enemy's fire has not necessitated heavy reinforcing. But when the organic units have been broken up by losses or have been mixed up by an advance under fire or

over rough ground or by heavy reinforcing, then volleys cease to be practicable for ordinary troops and become very difficult to execute with highly trained troops.

Consequently volley firing should be confined to the longer ranges before the organic units are mixed or broken up. Indeed they are essential at such ranges to enable the effect of the fire to be properly watched and the elevations corrected if necessary. But after a while when volleys are no longer possible, mass firing must be resorted to. Many German writers will not even rely on the men stopping the firing of their own accord after 3 or 4 rounds, but rely on the use of a shrill whistle for this purpose, an instrument which every officer and N. C. O. should carry, and on the sound of which every man should be trained to cease firing. This I would advocate for the Canadian Militia.

Now to secure the greatest efficacy of fire one very important detail must never be forgotten. To avoid a multiplicity of estimates of the same range and to avoid adjacent sections firing with very different elevations, which has often happened, *the firing line of each battalion must be under a distinct commander (one of the field officers of the battalion) and distinct pauses must be made now and then in the firing along a wide front, that of a battalion at least.* This pause can be easily obtained by training, by the use of the whistle, and by the exertions of all the officers and N. C. Os. in the firing line. During these pauses the smoke will be allowed to clear away, objectives can be chosen and named and apportioned to different portions of the firing line, the ranges decided on by the range-finding squads, and any necessary alterations made in the elevations used, or the fire stopped for good, or the men made to advance. These distinct pauses on a wide front are required even in volley firing, and too much stress cannot be laid on them, for without them it is impossible to maintain a proper control over the fire to usefully direct it. In this way alone can an united action between all the parts of the firing line be ensured, and only in this way also can we employ company and even half battalion volleys, even when the smaller units are mixed up, for the purpose of "picking up the range,"* or for steadyng the men if they are getting excited. The greatest stress must be laid on having a distinct officer commanding the firing line, and on these regular distinct pauses in the fire over a wide front during any kind of firing, if a control over the fire is to be maintained.

Thus, as a rule, volley firing is better adapted to the defence than to the attack and to long range firing, while mass firing is best suited to the medium and short ranges when so much reinforcing has taken place that the units have got mixed up. This mass firing seems to be in complete accordance with the requirements of battle in those periods when organic units have ceased to exist as such and when reinforcements are being boldly pushed into the firing lines to drive it forward. By making use of it the men will fire more naturally and more effectively and will be less affected by the

* Volleys are required for picking up the range by watching the strike of the bullets. Volleys should also be used against a retreating enemy after his position has been carried.

disturbing sounds of battle, and it is most probable that the control of the men will be less difficult, provided regular distinct pauses in the fire are made after every few rounds.

Mass firing requires just as much training and practice as volley firing to obtain good results. We cannot lay too great stress on the importance of habit and custom. Men must be accustomed in peace time to the use of mass firing, if we desire to make use of it in war.

(8). As regards the rapidity of fire, a slow fire (1 round a minute) should be maintained against bad targets and a quick fire (4 to 5 rounds a minute) against good targets, also the shorter the range the more rapid should the fire be. But it must be carefully remembered that quick firing must only be obtained by *quick loading* and not merely by hasty aiming.

It should also be remembered that in the long and medium ranges accuracy of fire is more essential than rapidity of fire.

Careful aiming and firing are required for all firing in order to get good results. Rapid firing gained by rapid aiming has a very bad effect on the men and leads to loss of control and waste of ammunition, while it soon creates a thick cloud of smoke, which prevents proper aim being taken.

(9). The moments of advancing and halting must be left to the judgment of the senior officers in the firing line. As a rough rule it may be said that, when advancing by alternate rushes, at each halt the men after adjusting their sights to the new range should be allowed to fire 3 rounds. It will then be time to advance again.

(10). As regards the attitudes of the men, they should lie down at the longer ranges, and then as the ranges decrease they should kneel, and finally at the shorter ranges stand. If they are allowed to lie down at the shorter ranges it will take away from the vigor of the attack and it is hard to make the men get up again. Material losses are not the only losses to be considered,—loss of *moral* is even more important. Further, when the men are breathing hard for want of breath the lying down position is a bad one for good firing, and long grass and small folds in the ground will prevent a recumbent man from seeing the enemy.

(11). Bayonets should be fixed at about 300 yards from the enemy from the moral effect produced by so doing. The men should be taught and thoroughly impressed with the idea that the fixing of bayonets is a sign that it is safer to go on than to retire over the fire swept ground over which they have already advanced.

(12). The question of replenishing the ammunition that has been expended cannot well be entered into here. It is a subject which is large enough to form the subject of a separate lecture; but it may be remarked that the replenishing of expended ammunition to any considerable extent under an effective fire is considered to be so difficult that nearly every military writer of note insists on the necessity of the men being given all the ammunition they may require before they are sent into action. Consequently the leading troops should have from 150 to 200 rounds per man, while those intended for the assault need only have 50 to 70 rounds per man on their persons.

Concluding Remarks.

I must now, gentlemen, draw my remarks to a close. I have endeavored to place before you as simply and concisely as I could the vitally important subject of *how to make the best use of rifle fire in the field*. I have pointed out to you the nature of modern fighting against a civilised foe, and the important part assigned in that fighting to the prolonged fire fight. It is in this fire fight that the foundations of victory are laid, and hence it is absolutely essential to make this fire fight as effective as possible. The advance of the firing line may frequently be checked, and the firing line will even sway backwards and forwards, according as it feels the pressure of the enemy's fire, or is carried onwards by the impulses given to it by any fresh troops sent into it from the rear. These losses and reinforcements will soon break up and mingle together the smaller units, and this disorganisation will lead to demoralisation and loss of control unless means are taken to prevent it. These means must be based on the possibilities and peculiarities of human nature, and on the characteristics impressed on it by training, discipline, custom and habit. Custom and habit are prime factors on the battle field, for in time they become a second nature. What men are taught and are habituated to in peace training they will do in war, even in moments of the greatest moral and mental strain. Herein lies the great value and necessity of training to correct principles and methods, and consequently for the necessity for practicing *the men* in volley and mass firing, in ceasing and opening fire by command, and in aiming at the enemy's feet on all occasions with a full foresight, and with the elevation ordered; the *N. C. Os.* in the control of fire; and *the officers* in directing the fire.

The present lines of progress in the development of infantry fire in the field lie:

(1). In *the mechanical improvement of the rifle and its ammunition*, giving it a higher muzzle velocity, a lower trajectory, and a greater rapidity of loading.

(2). In *a mechanical use of the rifle* as far as possible independent of the nerves of the man using it, and requiring no adjustment of sights for the short ranges, and hence no estimation of such ranges and no fine aiming.

(3). In *a mechanical lowering of the trajectory* by aiming at the foot of the objective; and

(4). In *a mechanical obedience of the men*, called *fire discipline*, the result of routine, and which allows, as far as possible, of the direction and control of the fire at all periods of the fight and consequently of its best use.

What will be the result of these lines of progress in the next war is difficult to foresee, for I may remind you that the whole subject of Fire Tactics, as now understood and practiced, has never as yet been tried in war. Improved guns and rifles, smokeless powder, shrapnel fire, and improved methods of utilising infantry fire, have yet to tell their tale. In the meantime, we can only try and realise what is the best thing to be done, in the light of peace experiments, and train our troops accordingly. And this, gentlemen, I have endeavored to do this evening.

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Extracts from Constitution

II.—OBJECTS.

The promotion of Military Art, Science, and Literature, and for social purposes.

III.—MEMBERSHIP.

There shall be three classes of members:—

- (a) Ordinary,
- (b) Privileged, and
- (c) Honorary.

(1) Ordinary members may be either resident, or non-resident, and shall be confined to officers and ex-officers of H. M. Regular and Auxiliary Forces and of the Canadian Militia, and only such shall have the right to vote.

(2) A resident member is one whose residence or place of business is within 10 miles of the Toronto post-office.

(4) All officers of the Army and Auxiliary Forces and of the Canadian Militia shall be admissible as privileged members during a period not exceeding two weeks, on being introduced by a member; such privilege not to be repeated within six months.

IV.—SUBSCRIPTIONS.

The annual subscription of resident members shall be \$5.00; of non-resident members, \$2.50, payable in advance on the 1st January of each year.

VII.—ELECTION OF MEMBERS.

(1) All persons desirous of being admitted to the Institute as members must be proposed by a member and seconded by another, and his name posted in the rooms of the Institute for at least two weeks prior to election. The Committee of Management shall elect all members by ballot, five thereof to form a quorum for this purpose, and two black balls shall exclude.

(2) Honorary members must be recommended by the Committee, and their names shall be posted in the rooms for at least one month before a general meeting of the members. The election of Honorary members to be by general ballot of the members at any regular meeting of the Institute, at which twenty members are present, and all candidates must receive a two-thirds vote of those present.

It is confidently anticipated that the Institute, by furnishing information upon military subjects, in the form of Lectures, a Library, Reading Room, etc., and providing as well many of the conveniences of a Club, will be the means of materially increasing the efficiency of the Militia force of Canada.

The Committee looks for a liberal support from those who now are, or have been, connected as Officers with any of the military bodies of the Empire, and would ask for an early application for membership, which may be made to the Secretary, or any of the Committee.